

REMARKS

Favorable reconsideration of this application, as presently amended and in light of the following discussion, is respectfully requested.

Claims 1-4, 7-11, and 14-34 are currently pending. Claims 1-4, 7-11, 14-18, and 21-34 have been amended by the present amendment. The changes to the claims are supported by the originally filed specification and do not add new matter.

In the outstanding Office Action, Claims 1 and 21 were rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,995,581 to Ozaki (hereinafter “the ‘581 patent”); Claims 7, 14, 19, 20, 23, and 26 were rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,549,645 to Oikawa et al. (hereinafter “the ‘645 patent”); Claims 2-4 and 22 were rejected under 35 U.S.C. § 103(a) as being unpatentable over International Publication No. WO 02/43801 to Wang (hereinafter “the ‘801 patent”) in view of U.S. Patent No. 7,103,205 to Wang et al. (hereinafter “the ‘205 patent”); Claims 8, 15, 24, and 27 were rejected under 35 U.S.C. § 103(a) as being unpatentable over the ‘518 patent in view of the Aird et al. reference (“CT Simulation for Radiotherapy Treatment Planning”); Claims 9-11, 16-18, 25, and 28 were rejected under 35 U.S.C. § 103(a) as being unpatentable over the ‘801 and ‘205 patents, further in view of the Aird et al. reference; Claims 29 and 32 were rejected under 35 U.S.C. § 103(a) as being unpatentable over the ‘801 and ‘205 patents, further in view of U.S. Patent No. 7,295,691 to Uppaluri et al. (hereinafter “the ‘691 patent”); and Claims 30, 31, 33, and 34 were rejected under 35 U.S.C. § 103(a) as being unpatentable over the ‘801 and ‘205 patents, further in view of the Aird et al. reference and the ‘691 patent.

Amended Claim 1 is directed to (1) a sick portion detecting device configured to detect a lung cancer candidate as a sick portion candidate by automatically extracting a lung field based upon a simple X-ray image acquired by a first modality, and extracting the lung

cancer candidate in the lung field; and (2) a correspondence displaying device configured to relate the position of the detected lung cancer candidate to an X-ray CT image of a plurality of X-ray CT images acquired by a second modality different from the first modality, and to display the X-ray CT image having an axial face corresponding to a position of a selected mark that corresponds to the position of the lung cancer candidate displayed on the simple X-ray image. The changes to Claim 1 are supported by the originally filed specification and do not add new matter.¹

The '581 patent is directed to an X-ray diagnostic system including an X-ray fluoroscopy apparatus providing a computed radiography image composed of digital pixel values produced from X-rays transmitted through an object subjected to fluoroscopic X-rays. In particular, the '581 patent discloses that a slice position of the object as the positional information required for the X-ray CT scanner is obtained and provided for the X-ray CT scanner using this system.

However, Applicants respectfully submit that the '581 patent fails to disclose a sick portion detecting device configured to detect a lung cancer candidate as a sick portion candidate by automatically extracting a lung field based upon a simply X-ray image acquired by a first modality, and extracting the lung cancer candidate in the lung field, as recited in amended Claim 1. Applicants respectfully submit that the '581 patent is silent regarding automatically extracting a lung field and extracting a lung cancer candidate in the lung field, as required by amended Claim 1. Rather, the '581 patent merely discloses locating a sick portion manually.

For the reasons stated above, Applicants respectfully submit that the rejection of Claim 1 is rendered moot by the present amendment to that claim.

¹ See, e.g., Figures 4 and 7-9 and the discussion related thereto in the specification.

Independent Claim 21 recites limitations analogous to the limitations recited in Claim 1 and has been amended in a manner analogous to the amendment to Claim 1. Accordingly, for the reasons state above, Applicants respectfully submit that the rejection of Claim 21 is rendered moot by the present amendment to that claim.

Amended Claim 7 is directed to (1) a sick portion detecting device configured to detect a lung cancer candidate as a sick portion candidate by automatically extracting a lung field based upon an X-ray CT image acquired by one modality, and extracting the lung cancer candidate in the lung field; (2) an image transforming device configured to transform volume image data acquired by the one modality into a digitally reconstructed radiograph using a selected viewpoint; and (3) a correspondence displaying device configured to relate the position of the lung cancer candidate detected by the sick portion detecting device to the digitally reconstructed radiograph and to display the digitally reconstructed radiograph corresponding to a position of a selected mark that corresponds to the position of the lung cancer candidate displayed on the X-ray CT image having an axial face.

The '645 patent is directed to an image processing method including generating three dimensional data, calculating a second version of three dimensional data by calculating a standard deviation of the three dimensional data; setting radiation conditions; interpolating voxel values of the second version of the three dimensional data on a ray irradiated from a radiation source; generating a digitally reconstructed radiograph by adding up the voxel values interpolated along the ray; and displaying the generated digitally reconstructed radiograph.

However, Applicants respectfully submit that the '645 patent fails to disclose a sick portion detecting device configured to detect a lung cancer candidate as a sick portion candidate by automatically extracting a lung field based upon an X-ray CT image acquired by one modality, and extracting the lung cancer candidate in the lung field. Applicants

respectfully submit that the '645 patent is completely silent regarding automatically extracting a lung field and extracting the lung cancer candidate in the lung field, as required by Claim 7. Accordingly, Applicants respectfully submit that the rejection of Claim 7 is rendered moot by the present amendment to that claim.

Independents Claims 14, 23, and 26 recite limitations analogous to the limitations recited in Claim 7, and have been amended in a manner analogous to the amendment to Claim 7. Accordingly, for the reasons stated above, Applicants respectfully submit that the rejections of Claims 14, 23, and 26 (and all associated dependent claims) are rendered moot by the present amendment to Claims 14, 23, and 26.

Amended Claim 22 is directed to (1) detecting a first lung cancer candidate as a first sick portion candidate by automatically extracting a first lung field based upon a simple X-ray image acquired by a first modality, and extracting the first lung cancer candidate in the first lung field; (2) detecting a second lung cancer candidate as a second sick portion candidate by automatically extracting a second lung field based upon an X-ray CT image related to the same region of interest of the same subject acquired by a second modality different from the first modality, and extracting the second lung cancer candidate in the second lung field; and (3) comparing the results of detection at the first and second detecting, wherein positions of marks respectively selected based upon the first and second lung cancer candidates respectively displayed on the simple X-ray image and on the X-ray CT image having an axial face are compared.

Regarding the rejection of Claim 22 under 35 U.S.C. § 103(a), the Office Action asserts that the '801 patent discloses everything in Claim 1 with the exception that the second image is an X-ray CT image, and relies on the '205 patent to remedy that deficiency.

However, Applicants respectfully submit that no matter how the teachings of the '801 and '205 patents are combined, the combination does not teach or suggest detecting a first

lung cancer candidate as a sick portion candidate by automatically extracting a first lung field based upon a simple X-ray image acquired by a first modality, and extracting the first lung cancer candidate in the lung first field; and detecting a second lung cancer candidate as a sick portion candidate by automatically extracting a second lung field based upon an X-ray CT image, and extracting the second lung cancer candidate in the second lung field, as required by Claim 22.

In this regard, Applicants note that the '801 patent is directed to a breast cancer screening system, while the '205 patent is also directed to a method for facilitating the detection of abnormalities in the breast using X-ray and ultrasound imaging. However, Applicants respectfully submit that both the '801 and '205 patents are completely silent regarding the detecting of lung cancer candidates and automatically extracting a lung field, as required by amended Claim 22. Accordingly, for the reasons stated above, Applicants respectfully submit that the rejection of Claim 22 is rendered moot.

Further, Applicants note that the '801 patent is directed to the use of an ultrasonic system for the diagnosis of breast cancer, but that an ultrasonic system would not be used for the diagnosis of a lung field. In particular, Applicants note that it is well known that there are disincentives for using ultrasound for the lung field, due to the inappropriate size of the lung field and reflection of ultrasonic waves from ribs. Thus, Applicants respectfully submit that there will be no motivation for one of ordinary skill in the art to modify the teachings of the '205 patent for extracting a lung field.

Claim 2 recites limitations analogous to the limitations recited in Claim 22 and has been amended in a manner analogous to the amendment to Claim 22. Accordingly, for the reasons stated above, Applicants respectfully submit that the rejection of Claim 2 is rendered moot by the present amendment to that claim.

Amended Claim 8 is directed to (1) an image transforming device configured to transform volume image data acquired by one modality into a digitally reconstructed radiograph using a selected viewpoint; (2) a sick portion detecting device configured to detect a lung cancer candidate as a sick portion candidate by automatically extracting a lung field based upon the digitally reconstructed radiograph, and extracting the lung cancer candidate in the lung field; and (3) a correspondence displaying device configured to relate the position of the lung cancer candidate detected by the sick portion detecting device to an X-ray CT image acquired by the one modality and to display the X-ray CT image having an axial face corresponding to a position of a selected mark that corresponds to the position of the lung cancer candidate displayed on the digitally reconstructed radiograph.

Applicants respectfully submit that the rejection of Claim 8 is rendered moot by the present amendment to that claim. In particular, Applicants respectfully submit that, no matter how the teachings of the '581 patent and the Aird et al. reference are combined, the combination does not teach or suggest a sick portion device configured to detect a lung cancer candidate as a sick portion candidate by automatically extracting a lung field based the digitally reconstructed radiograph, and extracting the lung cancer candidate in the lung field, as recited by amended Claim 8. As discussed above, the '581 fails to disclose this limitation. Further, Applicants note that the Aird et al. reference is directed to the use of a CT device for radiotherapy treatment and for a full 3D viewing and planning of a patient. However, the Aird et al. reference is silent regarding automatically extracting a lung field based upon a digitally reconstruction radiograph, and extracting the lung cancer candidate in the lung field, as required by amended Claim 8. Accordingly, for the reasons stated above, Applicants respectfully submit that the rejection of Claim 8 is rendered moot by the present amendment to that claim.

Independent Claims 15, 24, and 27 recite limitations analogous to the limitations recited in Claim 8, and have been amended in a manner analogous to the amendment to Claim 8. Accordingly, for the reasons stated above, Applicants respectfully submit that the rejections of Claims 15, 24, and 27 are rendered moot by the present amendment to those claims.

Amended Claim 9 is directed to a computer diagnostic system, comprising: (1) a first sick portion detecting device configured to detect a first lung cancer candidate as a first sick portion candidate by automatically extracting a first lung field based upon an X-ray CT image acquired by one modality, and extracting the lung cancer candidate in the first lung field; (2) an image transforming device configured to transform volume image data acquired by the one modality into a digitally reconstructed radiograph using a selected viewpoint; (3) a second sick portion detecting device configured to detect a second lung cancer candidate as a second sick portion candidate by automatically extracting a second lung field based upon the digitally reconstructed radiograph, and extracting the second lung cancer candidate in the second lung field; and (4) a detection result synthesizing device configured to compare the results of detection by the first and second sick portion detecting devices, wherein the detection result synthesizing device compares positions of marks respectively selected based upon the first and second lung cancer candidates respectively displayed on the X-ray CT image having an axial face and on the digitally reconstructed radiograph.

As discussed above, the combined teachings of the '801 patent and the '205 patent fail to disclose automatically extracting a lung field and extracting a lung cancer candidate in the lung field, as recited in Claim 9. Also, as discussed above, the Aird et al. reference fails to remedy that deficiency. Accordingly, Applicants respectfully submit that, no matter how the teachings of the '205 patent, the '801 patent, and the Aird et al. reference are combined, the combination does not teach or suggest the first and second sick portion detecting devices

recited in amended Claim 9. Accordingly, Applicants respectfully submit that the rejection of Claim 9 is rendered moot by the present amendment to that claim.

Independent Claims 16, 25, and 28 recite limitations analogous to the limitations recited in Claim 9, and have been amended in a manner analogous to the limitations to Claim 9. Accordingly, for the reasons stated above, Applicants respectfully submit that the rejections of Claims 16, 25, and 28 are rendered moot by the present amendment to those claims.

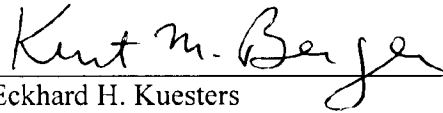
Regarding the rejection of dependent Claims 29-34 under 35 U.S.C. § 103(a), Applicants respectfully submit that the '691 patent fails to cure the deficiencies of the other cited references, as discussed above. Accordingly, for the reasons stated above, Applicants respectfully submit that the rejections of dependent Claims 29-34 are rendered moot by the present amendment to the independent claims.

Thus, it is respectfully submitted that Claims 1, 2, 7-9, 14-16, and 21-28 (and all associated dependent claims) patentably define over any proper combination of the cited references.

Consequently, in view of the present amendment and in light of the above discussion, the outstanding grounds for rejection are believed to have been overcome. The application as amended herewith is believed to be in condition for formal allowance. An early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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